PITCH CANKER INCIDENCE IN FERTILIZED AND NONFERTILIZED SLASH PINE PLANTATIONS

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INTRODUCTION

Pitch canker, caused by Fusarium moniliforme var subglutinans, is a serious pathogen of several tree species, but seems to be most severe on slash pine plantations in Florida. Several investigators have reported that pitch canker is more severe in fertilized stands.

One of the first reports was in 1966, where a slash pine stand, adjacent to a poultry house, was severely affected. This was later confirmed around other poultry operations, but the cause was unknown. Observations by managers have indicated that fertilized stands were more severely affected, but the relationship was not established. In 1976, Phelps and Chellman (2) reported that pitch canker seemed to be more severe on fertilized sites. Wilkinson, et al., in 1977 (3), reported that heavy application of N-P-K (200-200-200 lbs/AC) was associated with an increased incidence of pitch canker. In 1981, Fisher, Garbett, and Underhill (1) reported the addition of large amounts of nitrogen plus phosphorus fertilizer to an infected slash pine stand increased mortality and decreased tree growth. People have frequently noted an increased occurrence of pitch canker around fertilizer loading areas and other places where nutrient levels are high. Since 1973, the Apalachicola National Forest has been fertilizing slash pine stands with 12-46-0 at 300 lbs/AC. The Southeastern Forest Experiment Station (E. A. Hebb) has maintained control plots in several stands for growth analysis. During 1979, the station made the plots available for use in assessing pitch canker occurrence in fertilized and check plots. This was an especially good area for study, since the occurrence of pitch canker on the forest had been monitored since 1976.

This evaluation was undertaken to see if the type and rate of fertilizer used on the Apalachicola National Forest influenced pitch canker incidence or severity.

METHODS

Three hundred trees were examined in seven fertilized and nonfertilized plots. Sufficient buffers were maintained to insure that measured trees had received the proper treatment or no treatment. Each tree was examined for the presence of pitch canker in this year's growth, last year's growth, and the 3 year old growth. Therefore, each tree received 3 codes using the following system:

	% Infection
1 = Healthy	a = 1-10%
2 = Diseased terminal	b = 11-25%
3 = Diseased lateral	c = 26-50%
4 = Diseased terminal & lateral	d = > 50%

A code of 4b/2/1 for an individual tree meant that 11-25 percent of the overall tree was infected and that both this year's terminal and laterals were infected. Only the terminal from the year before was diseased, and the rest of the prior growth was healthy.

To insure that we were in the right plots and that fertilizer treatments could be determined, four needle samples, composed of about 100 needles, were taken per stand. These needles were taken from a disease-free terminal or lateral and included only the first flush needles. Each 25th tree was sampled, and if it was not possible to sample that tree, the next tree was taken. Soil samples were also taken at each of the above trees. Six plugs were taken 360° around the tree. Soil samples were mixed from each 300 trees and approximately 5 handfuls of soil put into plastic bags and labeled. The needles were also mixed from each 300 trees, and some of these were taken, placed in paper bags, and labeled.

RESULTS

Tables 1 and 2 present the nutrient levels, growth response, and occurrence of pitch canker in paired fertilized and nonfertilized plots. Table 1 presents the results for the nonfertilized plots. Table 2 presents the results of the fertilized plots. The stand numbers indicate which plots were paired.

The parts per million of phosphorus in the soil were higher in all fertilized plots where paired data were available. On the average, there was about 4.5 times as much phosphorus in the fertilized plots as in the unfertilized plots. Tissue analysis showed that the phosphorus levels were equal to or higher in the fertilized stands when compared to the nonfertilized plots. All fertilized plots had increased growth the year after fertilization when compared to the nonfertilized plots. On the average, there was increased growth in the fertilized plots (2.97mm) over the nonfertilized plots (.83mm). On the average, 28.3 percent of the trees in the nonfertilized plots had pitch canker as compared to 30.1 percent in the fertilized plots. A check of plot by plot disease occurrence showed that 3 of the fertilized plots had more pitch canker, 3 had less, and 1 plot was the same. A comparison of severity and occurrence in 1979, 1978, and older showed no trends, with the average in fertilized and nonfertilized plots about the same.

CONCLUSIONS AND DISCUSSION

The fertilizer rates used on the slash pine stands did not affect the occurrence or severity of pitch canker in treated stands on the Apalachicola National Forest. This supports, but does not conclusively prove, that moderate rates of fertilization in slash pine stands with fertilizers low in nitrogen does not increase or decrease pitch canker. Other research indicates that very high or very low nutrient levels may increase pitch canker. Also, other factors, such as climatic conditions, inoculum density, vectors, etc., were not monitored before or during the fertilization period. These could affect the cause/effect relationship.

Table 1.--Nutrient levels, growth, and occurrence of pitch canker in nonfertilized paired slash pine plots on the Apalachicola National Forest, 1979.

Stand #	Phosphorus		Growth Increase (mm)	Disease (%)	Severity (%)				1979 (%)			1978 (%)			Older (%)		
	Soil (ppm)	Tissue (%)			A	B	C	D	2	3	4	2	3	4	2	3	4
1		0.075	0.58	42.0	33.0	7.0	1.0	0.3	6.0	13.0	22.0	2.0	0.3	0.0	2.0	1.0	0.3
2	1.6	0.092	0.67	32.0	18.0	2.0	3.0	3.0	6.0	5.0	15.0	5.0	0.6	11.0	6.0	0.0	0.0
3	3.0	0.071	0.55	33.0	20.0	6.0	2.0	3.0	8.0	6.0	18.0	5.0	1.0	9.0	8.0	0.0	0.0
4	1.8	0.078	0.75	29.0	19.0	7.0	1.0	0.3	5.0	8.0	15.0	1.0	0.0	0.6	0.0	0.0	0.0
5	2.6	0.064	0.55	29.0	20.0	4.0	3.0	2.0	3.0	7.0	17.0	22.0	0.0	0.0	0.0	0.0	0.0
6	2.2	0.070	2.54	24.0	14.0	6.0	2.0	0.6	8.0	4.0	11.0	5.0	0.3	12.0	8.0	0.0	0.0
7	2.2	0.045	0.14	9.0	7.0	1.0	0.3	0.0	3.0	3.0	2.0	12.0	0.0	0.0	0.3	0.0	0.0
Avg.	2.2	0.071	0.83	28.3	18.7	4.7	1.8	1.3	5.6	6.6	14.3	7.4	0.3	4.7	3.5	0.1	0.04

Table 2.--Nutrient levels, growth response, and occurrence of pitch canker in fertilized paired slash pine plots on the Apalachicola National Forest, 1979.

Stand #	Phosphorus Soil (ppm)	Phosphorus Tissue (%)	Growth Increase (mm)	Disease (%)	Severity (%) A	Severity (%) B	Severity (%) C	Severity (%) D	1979 (%) 2	1979 (%) 3	1979 (%) 4	1978 (%) 2	1978 (%) 3	1978 (%) 4	Older (%) 2	Older (%) 3	Older (%) 4
1	9.0	0.091	1.62	38.0	27.0	6.0	4.0	1.0	6.0	6.0	25.0	7.0	0.0	7.0	5.0	0.0	0.0
2	5.0	0.092	4.47	27.0	17.0	3.0	1.0	0.6	4.0	7.0	11.0	3.0	0.3	7.0	1.0	0.0	0.0
3	17.0	0.098	2.67	33.0	24.0	7.0	0.3	2.0	9.0	4.0	19.0	2.0	0.3	3.0	2.0	0.0	0.0
4	15.0	0.084	1.25	43.0	30.0	11.0	2.0	0.0	7.0	13.0	23.0	1.0	0.0	0.0	0.6	0.0	0.0
5	5.2	0.092	2.28	17.0	13.0	2.0	0.3	0.3	2.0	5.0	9.0	5.0	0.0	0.0	0.0	0.0	0.0
6	12.0	0.098	5.65	37.0	25.0	6.0	3.0	3.0	10.0	6.0	21.0	10.0	0.6	11.0	9.0	0.0	0.0
7	5.0	0.106	2.86	16.0	14.0	2.0	0.0	0.0	3.0	4.0	9.0	15.0	0.0	0.0	1.0	0.0	0.0
Avg.	9.7	0.094	2.97	30.1	21.4	5.3	1.5	1.0	5.9	6.4	16.7	6.1	0.2	4.0	2.7	0.0	0.0

(1) Fisher, R. F., W. S. Garbett, and E. M. Underhill. 1981. Effects of fertilization on healthy and pitch canker-infected pines. Southern Journal of Applied Forestry, July. pp. 77-79.

(2) Phelps, W. R. and C. W. Chellman. 1976. Evaluation of pitch canker in Florida slash pine plantations and seed orchards. USDA Forest Service, Southeastern Area, State and Private Forestry, Coop. Fla. Div. For. 22 pp.

(3) Wilkinson, R. C., E. M. Underhill, J. R. McGraw, W. L. Pritchett, and R. A. Schmidt. 1977. Pitch canker incidence and fertilizer - insecticide treatment. University of Florida Progress Report 77-1. 4 pp.

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Pitch Canker in Fertilized Stands

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The Apalachicola District has several paired fertilizer plots. Many of these paired plots have pitch canker infections. Seven of these affected areas were surveyed to assess a change in pitch canker that may have been caused by the fertilization.

The enclosed report describes the details of the survey and the results. Overall, the data shows that the fertilizer rates used on these slash pine plots did not affect the occurrence or severity of pitch canker.

Please feel free to call if you have any questions.

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Field Representative

Enclosure

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